SAMUEL'S SONG SPARROW (*Melospiza melodia samuelis*)

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Criteria Scores

Population Trend	Range Trend	Population Size	Range Size	Endemism	Population Concentration	Threats
15	0	5	10	10	5	10

Special Concern Priority

The San Pablo, or Samuel's song sparrow is currently considered a Bird Species of Special Concern (year-round), Priority 2. No subspecies were included on the original list (Remsen 1978), but all three tidal marsh song sparrow subspecies were included on CDFG's (1992) list, including Samuel's song sparrow.

Breeding Bird Survey Statistics for California

Data inadequate for trend assessment at the subspecies level (Sauer et al. 2000)

General Range and Abundance

The San Pablo song sparrow is a California endemic. Its year-round range is confined to tidal salt marsh habitat fringing San Pablo Bay from San Pablo Point in Richmond at the southern end and the western edge of the Carquinez strait to the east. In eastern Marin County the range extends north from Richardson Bay. Populations occur in tidal salt marshes, muted marshes and some diked marshes lining the bayfront, rivers and major creeks in western Contra Costa County, eastern Marin County, southern Sonoma County and southwestern Solano County (Grinnell and Miller 1944; PRBO unpubl. data).

Samuel's song sparrow is distinguishable from most of the other Bay Are song sparrow subspecies by coloration and size. Dorsal coloration is considerably darker (more blackish-brown) than the upland subspecies and other tidal marsh subspecies (Marshall 1948). It is intermediate in size between the larger *M. m. maxillaris* (Suisun song sparrow, Suisun Bay) and *M. m. pusillula*

(Alameda song sparrow, San Francisco Bay) in terms of bill length, bill depth and weight, but similar to *pusillula* in terms of tarsus length and wing length (Marshall 1948). Recent genetic analyses (using micosatellites) suggest that Samuel's song sparrow is not significantly genetically distinct from the Suisun song sparrow or the subspecies *M. m. heermanii* found in Sacramento Valley riparian habitat (Chan and Arcese 2002).

Seasonal Status in California

Occurs year round; breeding season extends from early March (late February in some populations) to July.

Historical Range and Abundance in California

Grinnell and Miller (1944) described the San Pablo song sparrow as an "abundant" resident in the "salt marshes along the north side of San Francisco and San Pablo bays, from Richardson Bay east to Carquinez Strait; also on the south side of San Pablo Bay southwest to San Pablo Point on Richmond headland."

Specimens were collected prior to 1944 in "Petaluma and Second Napa Slough, Sonoma County; Napa River, 5 ¾ miles south of Napa, Napa County; south Vallejo Marsh, Solano County; near Pinole, Sobrante and San Pablo, Contra Costa County" (Grinnell and Miller 1944). Historic confirmed breeding locations include marshes at Greenbrae and San Clemente in Marin Co (1918, 1921 respectively, MVZ egg collections).

No quantitative estimates of historic abundance exist. Prior to development, diking and filling that began in the 1800's, there were approximately 24,000- 25,780 ha of tidal marsh fringing San Pablo Bay (SFEI 1998; Marshall and Dedrick 1994). Based on Grinnell and Miller's (1944) observations, and recent studies (PRBO unpubl. data) indicating song sparrows are presently ubiquitous residents of even the smallest marsh fragments where sufficient high marsh vegetation exists, we assume that Samuel's song sparrows were present pre-development throughout San Pablo Bay marshes and that densities were similar to current estimates of 14.9 birds per ha (95 % c.i.: 12.6

to 17.7, Nur et al. 2001). The total population size prior to development and diking was probably at least 300,000 birds.

Recent Range and Abundance in California

The present range and abundance of Samuel's song sparrows have been studied extensively by PRBO Conservation Science, who have been conducting variable circular plot point count surveys at 30 sites in San Pablo Bay since 1996 (Nur et al. 1997; Nur et al. 2001). Previous attempts to calculate regional abundances and population sizes have been attempted with density or abundance estimates from one or only a few sites (Walton 1975, Marshall and Dedrick 1994).

The general range of the San Pablo song sparrow is probably relatively unchanged since Grinnell and Miller's (1944) account. By 1944, much of the historic tidal marsh habitat had already been diked and filled. Long stretches of tidal marsh, particularly in Contra Costa County and Marin County, were already lost to urban development. Most of the diked areas in the northern part of San Pablo Bay were being used as pasture, and after the 1950's, large areas of were converted from pasture to salt ponds, croplands and vineyards (Goals Project 1999). Since that time, habitat loss and degradation have been gradual. The effects of this habitat degradation on song sparrow populations are unknown.

The present area of fully tidal marsh in San Pablo Bay has been calculated as 5694.6 ha (Marshall and Dedrick 1994) to 6541 ha (SFEI 1998). An additional 339 ha exist as muted marsh (SFEI 1998), i.e. with muted tidal flow, some of which is suitable for song sparrows, including Tubbs Island, in Sonoma County where densities are comparable to that found in fully tidal marshes (PRBO unpubl. data). The total area of available habitat presently is only 28.6 % of the historic area. Much of the remaining marsh is highly fragmented, and the surrounding habitat is highly degraded and developed. Only one continuous tract of tidal marsh is greater than 1000 ha (Petaluma Marsh), 14 parcels are greater than 100 ha, 95 are between 2 ha and 100 ha and 65 are

smaller than 2 ha (SFEI 1998). Half of the existing tidal marsh habitat, and thus presumably at least half of the existing population of Samuel's song sparrows, is found within the 6 largest sites.

Song sparrows were found in every tidal marsh site, and several restoration and muted marshes, surveyed in San Pablo Bay from 1996 to 2002 (PRBO unpubl. data). They range in abundance from sparse to very numerous. Absolute densities range from fewer than 10 birds per ha in marsh fragments under 2.5 ha in Marin County to more than 20 birds per ha in some larger marshes (based on spot-mapping data at smaller sites and estimated from variable circular plot point count data at larger sites; PRBO unpubl. data). The mean density for 25 San Pablo Bay sites surveyed in 2000 was 14.9 birds per ha (95 % confidence interval 12.6 to 17.7; Nur et al. 2001). Densities derived independently from intensive spot-mapping efforts in 2000 and 2001 at three nest–monitoring sites in San Pablo Bay ranged from 4.55 to 5.58 territories per ha at Black John Slough (9.1 – 11.6 breeding birds per ha); 6.77 to 7.68 territories per ha at China Camp State Park (13.54 – 15.36 birds/ha) and 6.54 to 8.09 territories per ha at Petaluma Rivermouth, the tidal marsh outboard of the Sonoma Baylands Restoration Project (13.08 – 16.18 birds/ha; PRBO unpubl. data).

Johnston (1956a, 1956b) reported an average density of 5.49 Samuel's song sparrow individuals /ha (2.47 territories per ha; 1.11 territories per acre) at his single study site in Richmond at the mouth of Wildcat Creek. This figure was based on intensive spot-mapping efforts within a site with an extensive, unoccupied high marsh area, which is uncharacteristic of the marshes in San Pablo Bay (pers. obs.).

The most recent estimate of the Samuel's song sparrow population size is 77,457 (in 2000; Nur et al. 2001). This figure is based on areas calculated using EcoAtlas (SFEI 1998) and the mean absolute density of 14.9 birds per ha (calculated with Distance software, Buckland et al. 1993). Marshall and Dedrick (1994) estimated the population size at 31,200 birds. This figure was derived from a calculated area of 5694.6 ha tidal marsh and Johnston's (1956b) density of 5.49 birds per ha.

Ecological Requirements

Samuel's song sparrows are found in virtually every tidal salt marsh studied in San Pablo Bay, but as discussed above densities varied considerably, presumably due to habitat suitability (e.g., vegetation structure and type), and other marsh characteristics affecting habitat choice, predation and other sources of mortality (PRBO unpubl data). As with all song sparrow subspecies throughout their range, dense vegetation is required for nesting sites, song perches, and as cover for hiding (Marshall 1948a). Where vegetation is too short and sparse, Samuel's song sparrow nests are more likely to be exposed to predators or flooded during high tides (Marshall 1948a; Johnston 1956a; PRBO unpubl data). The dominant plants of tidal salt marshes in San Pablo Bay are cordgrass (*Spartina foliosa*) in low elevations, pickleweed (*Salicornia virginica*) at higher elevations, and gumplant (*Grindelia stricta)* on higher ground along slough edges and man-made levees. Marshall (1948) noted that song sparrows were either absent or less dense where *Spartina* was less than 18 inches high or *Salicornia* was less than 12 inches high.

Samuel's song sparrows are primarily associated with tidal channels, especially in marshes dominated by pickleweed where gumplants line the channels. Sparrow territories are lined single file every 10 to 50 m along sloughs providing each pair with access to the slough and its overhanging banks for food and cover. Samuel's song sparrows use both natural and man-made channels (mosquito ditches), but territories along natural channels are smaller, indicating the habitat is of higher quality (Collins and Resh 1985). In marshes where there are no sloughs, tidal influence is still required, and in areas that are diked and the water is stagnant (which directly affects the vegetation) few song sparrows are found. In marshes with significant cover of alkali bulrush (*Scirpus maritimus*), tules (*Scirpus acutus*), or cattails (*Typha* spp), all tall plants associated with brackish to fresh water (e.g., Pond 2A in Napa Sonoma marsh, and Black John Slough on the Petaluma River), the association of song sparrows with channels is weaker (pers. obs.).

Finally, exposed ground for foraging has been noted as a requirement. In tidal salt marshes, dense *Salicornia* is opened by small mammal trails and tidal action. Marshall (1948a) notes that the densest vegetation within which song sparrows can exist is *Scirpus* whose base grows at least 1-2 inches apart, providing openings for foraging on the ground.

Analyses of the relationship between tidal marsh song sparrow abundance and a series of vegetation and habitat variables collected around point count stations indicate that song sparrows respond positively to shrub cover (primarily *Grindelia*) and *Juncus* cover (Nur et al. 2001). Collins and Resh (1985) also found a positive relationship between Samuel's song sparrow density and shrub cover (in their analysis: Coyote brush, *Baccharis pilularis*), as well as plant cover height and plant spatial diversity (Nur et al. 2001). At the landscape level, tidal marsh song sparrows are positively associated with marsh size, proximity to urban edge and proximity to larger marshes; i.e., song sparrows are more abundant near edges, and in larger, less-isolated marshes (Stralberg et al. 2001).

Samuel's song sparrow nest success is low; it ranged from 11% to 31% at 3 sites in San Pablo Bay during 1996 to 2001 (Spautz et al. 2001). This is low enough in some years to cause concern. Differences in success between sites were significantly different, with the highest success being found at the marsh at Black John Slough (Chan et al. 2001). Predation is the highest cause of nesting failure (65% of nests; Chan et al. 2001); other causes include tidal flooding and abandonment. Sites where nest success was lowest, and predation highest, were smaller, had higher perimeter to area ratios, and were more isolated (Chan et al. 2001). Thus, even though Samuel's song sparrows are present in marsh fragments in a large size range, smaller, more isolated marshes may be acting as population sinks due to lower reproductive success rates.

Threats

Further habitat loss, fragmentation and degradation are the primary threats to the Samuel's song sparrow. Alteration of the tidal marsh habitat due to invasive species of *Spartina* and

Lepidium may also have adverse effects. Reproductive failure caused by increasing levels of nest predation may also have a significant impact. Culprits may be non-native predators including house cats, Norway rat (*Rattus norvegicus*) and red fox (*Vulpes fulva*), and other native predators that respond to human disturbance such as crows and ravens. Increasing amounts of environmental contaminants may also affect reproductive success.

There is potential for drastic impacts on tidal marsh habitat if the sea level rises due to global warming. Due to the presence of levees and other man-made structures throughout the Bay, tidal marsh will not be able to accrete (rise) landward to offset increasing inundation. This habitat loss would affect the Samuel's song sparrow throughout its range.

Management and Research Recommendations

- Protect existing habitat and restore additional areas to tidal action in San Pablo Bay. Napa-Sonoma marsh restoration projects and numerous projects underway in Marin County are critical for this effort. Projects along the northern Contra Costa County shoreline, where little tidal marsh habitat remains, should be a high priority. The goal would be to restore large contiguous areas to full tidal action.
- Restore dispersal corridors, particularly in highly fragmented areas such as southern Marin and Contra Costa Counties.
- Reduce ditching for mosquito abatement
- Research the impact of invasive exotic plant species on tidal salt marsh habitat, including their impact on song sparrows' and other tidal marsh species' population density and reproductive success. In particular, *Spartina alterniflora*, which has yet to invade San Pablo Bay, and *Lepidium latifolium*, pepperweed, have the potential to alter the habitat significantly.

- Conduct research to identify habitat requirements and ecological conditions that support self-sustaining populations, with particular attention paid to ideal restoration of tidal marsh habitat.
- Identify nest predators.

Cogswell (2000) provides additional management recommendations for Samuel's song sparrow.

Monitoring Needs

The Breeding Bird Survey and Christmas Bird count are inadequate for monitoring changes in the population size for this subspecies. Samuel's song sparrow is restricted to tidal marshes; although some of these areas are accessible from roads, members of the public are not allowed to enter marsh habitat without a permit, due to US Fish and Wildlife Service regulations protecting the endangered California clapper rail and salt marsh harvest mouse. PRBO has been conducting standardized variable circular plot point counts in San Pablo Bay tidal marshes since 1996. This monitoring should continue in least at a sample of sites throughout San Pablo Bay to track song sparrow population trends. Monitoring of reproductive success should also continue.

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